

	M.
Length of centrum below.....	0.009
Depth to base neural spine, in front.....	.011
Width cup.....	.0054
Depth “.....	.0045
Expanse parapophyses above.....	.012
“ “ below.....	.008

From the Bad Lands of Cottonwood Creek, Wyoming.

ON A NEW GENUS OF PLEURODIRA FROM THE EOCENE OF WYOMING.

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The following observations are made with a view of establishing the stratigraphic position of the genus of tortoises described below. They were made by the writer while prosecuting a palaeontological investigation of the Tertiaries of Wyoming for Dr. F. V. Hayden's Geological Survey of the Territories.

The strata exposed along the northern and eastern shores of Bear River, consist of alternate sandstone, argillaceous, and conglomerate rocks of the Wahsatch Group of Hayden. They dip to the northeastward. At the coal mines below (*i. e.*, N. W. of) Evanstown, the series is capped by a heavy bed of conglomerate. At a point seven miles above (*i. e.*, S. E. of) Evanstown, the strata appear in the following order: (1.) an argillaceous rock just appearing above the river level at high water; (2.) 25 feet of sandstone; (3.) a nodular argillaceous rock of a red and ochreous color, 15 feet; (4.) 10 feet of coarse conglomerate; (5.) 80 feet of sandstones and clays.

At a point eleven miles above Evanstown, the conglomerate has descended from view, and the bluffs of 300 feet in height, consist of the upper members of the group, viz.: red and white argillaceous beds; sandstone four to six feet in thickness; a red and white argillaceous stratum, at least forty feet; sandstone 3-4 feet, and a capping of a hard, brittle, ash-colored clay rock on the highest points. Ascending five miles further to the N. E., the strata are observed to dip in a direction opposed to those at Evanstown, rising gently to the N. E. One of the heavier sandstone strata is exposed about half way up the bluffs, and is visible in the side ravines. Crossing one of these, and climbing the opposite spur, a sandstone identical lithologically with those just described, is seen standing vertically; and succeeding spurs are crowned with the edges of the succeeding sandstone beds standing high in the air. Nearly opposite Beartown, a mile eastward on the Union Pacific Railroad, these vertical sandstones pass into a conglomerate, one of the strata being composed equally of both, a gradual lithological transition being exhibited.

The nature of the flexure of these strata is somewhat obscure. The succession of vertical strata is quite similar to that already noted as seen in the bluffs of Evanstown, and the conglomerate would thus be regarded as the superior member. Dr. Hayden, however, describes them as contiguous to cretaceous strata further east.

We are assisted in concluding as to whether these beds which descend abruptly belong to the Wahsatch Group, by a consideration of the curious strata exhibited in the two railroad cuts just N. W. of Beartown, already described and figured by Dr. Hayden, in his report on the Geology of Wyoming, 1870, p. 150-153. In these, numerous thin strata, horizontal on the western end of the exposures, are suddenly decurved and become vertical to the eastward, both directions coinciding with those of the heavier and higher beds which compose the bluffs and ridges just described. That the whole is an anticlinal with the opposite strata of a very unequal dip, is rendered probable by the miniature exhibition seen in the section of the lower beds in the railroad cut.

The Wahsatch beds have been described by Dr. Hayden as wanting in vertebrate fossils. My assistant, Professor Garman, and myself succeeded, however, in discovering a number of species in the upper red and white strata on the bluffs eleven miles S. E. of Evanstown, or near the bend of Bear River. They occurred here on the upper, and upper middle portions, of the exposure. Extending our observations to the ridges of bluffs further to the southward, we found the same strata producing similar, and in several cases the same, fossils. They appeared lower down on the exposures, consistently with the dip of the strata, though a few were found near the top of these, also.

The species obtained were as follows :

1. Part femur of an ungulate, as large as *Palæosyops paludosus*.
2. End tibia of a Perissodactyle mammal.
3. *Notharctus vassacciensis*, Cope, sp. nov.
4. Dermal scuta of crocodile.
5. Fragments of a Crocodilian, perhaps *C. xiphodon*.
6. Fragments of a *Trionyx*, near *Tr. guttatus*.
7. *Notomorpha testudinea*, gen. nov. of tortoises.
8. " *gravis*, sp. nov.
9. " *garmanii*, sp. nov.
10. Fragments of an unknown reptile.
11. *Lepidosteus* scuta, perhaps like *L. glaber*.
- 12 and 13. Two species of *Unio*.

The specimens are all more or less fragmentary, and vary in color from nearly white to iron-rust color. The only ones whose specific characters are sufficiently preserved for description are those of the new genus *Notomorpha*. The facies resulting from the association of *Lepidosteus*, *C. xiphodon* and the mammals, is that of the Eocene of the Bridger Group on the eastern side of the Wahsatch. The new genus described has no Tertiary or Cretaceous relationships ; yet the only Pleurodira yet

found on this continent are Cretaceous, and the mode of attachment of pubis in these species resembles nearly that seen in *Notomorpha*, both differing from most recent genera in this respect.

NOTHARCTUS VASACCIENSIS. Cope. sp. nov.

Represented by a portion of the left ramus of the lower jaw, containing one tooth in perfect preservation. The structure of this indicates it to be the second true molar, and presents certain features of distinction from the same tooth of the *Lophiotherium sylvaticum*, described by Dr. Leidy. The crown presents four tubercles which are arranged in pairs, the separation between the right and left lobe of each being slight, thus giving the tooth the appearance of having two transverse crests as in *Hyrachyus*. The two anterior and outer posterior tubercles are fissured by wearing, but the inner posterior consists of two acute crests which meet, presenting an acute angle towards the adjoining tubercle. The outer posterior tubercle sends a descending crest obliquely to the base of the inner anterior tubercle as in *L. sylvaticum*. A small tubercle occupies the space behind the interval between the posterior tubercles and gives origin to a cingulum which passes round the bases of the outer tubercles. It extends round the front of the tooth to the outer anterior tubercle. Wear would produce small angular crescents from the two posterior and the outer anterior tubercle. Greatest length of crown, M. 0.008; width, .006. The enamel of the tubercles is rugose.

This ungulate was of about the size of the *L. sylvaticum*, or equal to the raccoon. It differs considerably from that species in the less isolation of the tubercles of the molar, and the crescentic form of the inner posterior.

Found by Samuel W. Garman, in the strata of the Wahsatch Group, N. E. of Evanstown, Wyoming.

NOTOMORPHA. Cope.

This form is one of the *Pleurodira*, and differs from most of those already known in the recent and fossil states, in having many features relating it to a terrestrial rather than an aquatic life. The elements of the carapace and plastron are massive, and the former was well arched; both exhibit well defined grooves for the sutures of the dermal scuta. The mesosternum is broad ovate, and the bones of the plastron are united by immoveable sutures. The elevated lateral processes of the hyo and hyposternal bones, are not broad, and unite by suture with the lower plate of the first and last bridge-marginal bones. They are thus recurved in both cases, but none of the ribs indicate any sutural union, as is seen in various genera. The costal bones unite with the marginals by serrate suture.

In one species a large intergular scutum has left its impression, the gulars being lateral and rather small. The anterior lobe of the plastron is emarginate.

The sutural union of the pubis with the xiphisternum is by an elongate

groove in a longitudinal elevation of the bone, much as in the Cretaceous genus, *Taphrosphys*, Cope. The point of attachment of the ischium is not observed nor is the posterior lobe of the plastron observed in any of the specimens. The external part of the hypoxiphisternal suture extends very obliquely backwards. The pubic suture-groove diverges very little from a line parallel with the common xiphisternal suture.

Of limb bones several fragments were found in connection with the *N. testudinea*, but are too large to be referred to that species. One is the extremity of a femur, which had a round shaft and but little curvature. The other is a proximal end, with a flat, wide trochanter, separated from the head by a deep notch, and with a slender curved shaft.

The genera of Pleurodira, which simulate land tortoises most, are found in Africa. They are *Sternotherus* and *Pelomedusa*. They are different enough from *Notomorpha*, the former in its hinged, ten-plated plastron, the latter in its intercalated bone of the plastron. The present form is, therefore, of interest in various ways. It is the first Pleurodira tortoise found west of New Jersey, and is the first of that division known to exist in the Tertiary formations of North America. As compared with those from the Cretaceous, it is distinct in many respects.

Specimens of this genus are more abundant than any other fossils in the localities in question. In two of the individuals, both xiphisternal bones are preserved; in one, the mesosternal; in two, the episternals, etc. Three species appear to be represented by my specimens, which vary from the size of the salt-marsh terrapin, *Malaclemmys palustris*, to that of the Mississippi snapper, *Macrochelys lacertina*.

NOTOMORPHA TESTUDINEA. Cope. spec. nov.

Represented by portions of four or more individuals. In one of these the anterior lobe of the plastron is in part preserved. The mesosternum is a transverse oval, the posterior margin regularly convex, the anterior with three equal borders. The median of these is concave. The sutures are radiating, and the groove separating the humeral scuta, appears to traverse the entire length of the bone. The outer surface is gently convex. The free margin of the episternal and hyposternal bones is acute, and with an internal thickening, as in *Cistudo*, *Testudo*, etc., forming a ridge, with abrupt inner face. This face extends backwards as a groove, to the axillary process of the hyosternal, forming a characteristic mark. Although the extremity of the episternal bone is lost, and the mesosternal exhibits no trace of the intergular scute, the outer sutures of the gular scuta are so far posterior, as to render it highly probable that the intergular plate existed. At the point where this suture reaches the margin, the latter is openly emarginate. The posterior suture of the humeral scute crosses the margin half way between the axilla and the episternal suture, and is not marked by a notch. The last named suture is transverse. On the xiphisternal bones the groove of the anterior suture of the anals is plainly visible. It is regularly convex forwards and in one specimen is double.

In a second specimen of about the same size, parts of two costal bones are preserved. They are thick, and display the usual costal and vertebral scute-sutures. The latter one in a groove, for the middle of the vertebrals is elevated, and the costals project shoulder-like just outside the groove.

In a third specimen a little larger, xiphisternals with several marginals are preserved. A free posterior marginal is regularly recurved, and the scute-sutures are deeply impressed. The marginal scuta have evidently been marked with concentric grooves within their margins. The first marginal bone of the bridge has a very obtuse edge.

In none of the specimens are the surfaces sculptured.

Measurements.

	No. 1.	M.
Width plastron at axilla.....		0.086
Length plastron from axilla (approximate).....		.05
Thickness hyosternal at mesosternal.....		.009
“ “ “ hyposternal.....		.0065
Width mesosternal.....		.037
Length “.....		.026
Thickness of a vertebral.....		.006
“ “ xiphisternal (normal).....		.004
“ “ “ at pubis.....		.007
No. 2.		
Thickness costal at hump.....		.0075
Width of costal.....		.0175
No. 3.		
Width of posterior marginal.....		.027
Length “ “.....		.019

The mesosternal, though found with No. 1, does not fit it exactly and does not belong to it.

NOTOMORPHA GRAVIS. Cope. species nova.

This species is known by portions of one, and probably of other specimens. The type is larger than any of the last described, and equalled some of the *Chelonias* of the ocean in dimensions. The right hyosternal bone indicates both resemblance and difference from the *N. testudinea*. The former is seen in the internal thickening parallel to the margin, bounded behind by a deep groove extending to the axilla. A peculiarity, in which it differs from the *N. testudinea*, is seen in the posterior position of the humero-pectoral dermal suture, which originates at the axilla. The epihyosternal suture is concave. The thickened portion of the episternal margin is shorter and wider than in the species just named, the width being to the length as 2.5 to 2; in *N. testudinea*, as 1.5 to 2.

	M.
Thickness of hyosternal anteriorly.....	.011
Width of costal, (?) second specimen.....	.058
Surfaces not sculptured.	

NOTOMORPHA GARMANII. Cope. spec. nova.

Represented by numerous fragments from a bluff, six miles north of the Bear River. There are numerous bones of the carapace and plastron. A characteristic piece is the episternal bone. It displays marked difference from the same element in the type of the genus, in lacking the acute edge and internal thickening. The margin is obtusely rounded and the suture with the hyosternal is convave. The anterior margin is truncate. The dermal sutural grooves are well marked. There is a large intergular scutum, which evidently encroached considerably on the mesosternal (a piece not preserved) and probably subtriangular in shape. The gulars are reduced to triangular areas on the outer anterior angles, the suture, with the humeral, being in front of the middle point between the angle and the hyosternal suture. The margin is less distinctly emarginate at this suture than in *N. testudinea*.

The marginal bones belong to both bridge and free edge. They are all much thickened medially, but with thin proximal sutural margins. The free ones are well recurved, and with regular, rather thickened margins. The bridge marginals have very obtuse margins. Their general massiveness is in contrast to the thinness of the costals of which there are numerous fragments. Portions of vertebral bones are intermediate in thickness. There is no thickening or ridge on each side of the vertebral scuta. The scutal grooves are everywhere well marked. The surface of the marginals and episternal is obsoletely rugose, somewhat as in some species of *Taphrosphys*, from the Cretaceous.

This species was about the size of *N. gravis*, and differs from it in the episternal bone, etc.

Measurements.

M.

Length of episternal (approximate).....	0.04
“ from posterior suture do. to gular scute.....	.02
Thickness episternal, behind.....	.011
Length of a marginal bone.....	.042
Width of same “ “045
Thickness “ “ “015
Width of a bridge-marginal.....	.04
Thickness of a vertebral.....	.007

This species is dedicated to my assistant and friend, Prof. Saml. W. Garman, of Chicago, whose eye detected the fragments which teach its character.

At a future time it is hoped that a fuller account of the fauna of this lake basin, now enclosed between the Eastern and Western ranges of the Wahsatch Mountains, may be given.